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NOVEMBER 4.

Mr. JOHN H. REDFIELD in the chair.

Fifty-seven persons present.

The functions and histology of the yolk-sack of the young Toad-fish.—

PROF. J. A. RYDER presented verbally some observations upon the microscopic anatomy of the yolk-sack of the young Toad-fish or *Batrachus tau*. Unlike the larvæ of other fishes, the young of this form do not at once escape from the egg-membrane when the latter is ruptured at the time of hatching but continue to adhere for a long period by means of an adhesive discoidal area on the under side of the yolk-sack to the inner side of a similar area of the egg-membrane which in turn is adherent by its external surface to some foreign object such as the under side of a stone, which forms the roof of the tiny cavern excavated by the parent at the time of oviposition.

The origin of the adhesive matter which causes the eggs to adhere to foreign bodies was well understood to be ovarian, but the origin of the adhesive matter covering the discoidal area on the under side of the yolk-sack has not until now been explained. If the cellular membrane covering the inferior pole of the yolk-sack be carefully dissected off, it is found to be much thickened as compared with the rest of the outer wall of the yolk. This thickening is found upon making vertical sections of the adherent area, to be due to the vertical lengthening and modification of the substance of the outer cells of the epidermis of this region. The peripheral ends of the cells of the epidermis are in fact here seen to be much prolonged in the form of a homogeneous, almost vitreous, looking material, which shows, by the way in which the ends of these cells are roughened or fractured, that they effect the adhesion of the yolk to the egg-membrane before alluded to by the speaker.

The whole of the free surface of the epidermis covering the yolk-sack is studded with scattered goblet or mucous secreting cells. At the edge of the adherent area of the epidermis there seems to be some evidence of the fact that these goblet cells are multiplied so as to completely cover the adherent area of the yolk-sack. If this is the case, which seems very probable, the cells causing the adhesion, for a time, of the yolk-sack and consequently the whole embryo, to the inner side of the egg-membrane, have originated from a multiplication and modification of the mucous or goblet cells completely covering the adherent area referred to.

Another remarkable peculiarity of the yolk-sack of the young Toad-fish is the presence of a layer of smooth muscular fibres underneath the epidermis and apparently originating from the splanchnic mesoblast. This muscular layer consists of two layers of spindle-shaped muscular fibres. One of these layers has its fibres running

equatorially round the pyriform yolk-bag, and the other, which is closely adherent to the first-named, has its fibres running at right angles to the latter, and consequently corresponding in direction with the greatest elongation of the yolk-sack. As far as the speaker is aware, nothing similar in the form of an involuntary muscular coat covering the yolk is known in any other embryo fish. Whether its function is to increase the strength of the yolk membrane under the peculiar conditions of tension or whether it served to force the contents of the yolk-bag within the abdominal parietes, as happens during the disappearance of the yolk, the speaker did not attempt to decide.

The statement in Jordan and Gilbert's *Synopsis of the Fishes of North America*, p. 750 that: "the young of some or all the species (of the Batrachidæ) fasten themselves to rocks by means of an adhesive ventral disk which soon disappears," must accordingly be qualified as incorrect so far as it carries the implication that the act of adhesion is a voluntary one on the part of the young fishes themselves. The researches of the speaker show very conclusively that the adhesion of young toad-fishes is effected in the first place, at the time of oviposition, by a mucous secretion covering the outer surface of the eggs, and this is supplemented at a later period, or after hatching, by the development, through a modification of certain cells at the surface of the yolk-sack, of an adhesive disk, produced by the modification of the substance of the peripheral or free portions of the cells of such an area which adheres to the inside of the egg-membrane. The embryo is thus left enchained for a period at the same place where the eggs were originally deposited but in such a way as to be free to respire the surrounding water and to freely vibrate the fins and tail. It is, therefore, clear that the fixation of young toad-fishes is a very complex process some of the steps of which are effected by the parent at the time of oviposition, while others are effected during the process of the development of the embryo itself, so that it is clear that such a fixation is not voluntary and has nothing in common with the voluntary and momentary adhesion, by means of modified fins such as is witnessed in the cases of the *Gobiesocidæ* and *Cyclopteridæ*.

NOVEMBER 11.

The President, Dr. JOSEPH LEIDY, in the chair.

Forty-eight persons present.

Remarks on Velella.—PROF. LEIDY exhibited specimens of *Velella mutica*, which with many others, were cast on shore at Beach Haven, N. J., in the early part of last August. The living ones were of a deep blue color and ranged from an inch and a half to three inches in the greater breadth. From them there were detached